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## Future changes in European windstorm severities and impacts

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Extratropical cyclones that impact Europe are significant natural hazards that can cause severe damages and lead to large socio-economic losses. There are large uncertainties associated with changes in storm number, and storm intensity, in future climate projections. Here we use a Lagrangian tracking algorithm applied to reanalysis data and to historical and two future scenario simulations of a number of CMIP6 models to investigate future changes in characteristics of windstorms over Europe. As well as storm frequencies and peak wind speeds, we also quantify changes in two versions of a storm severity index (SSI), one of which is population weighted. These metrics are calculated using the footprints of cyclones as they pass over the European continent.

The models show differing abilities to represent the historical SSI compared to ERA5. Future changes in SSI are somewhat uncertain, but tend to show an increase in severities over central and northwest Europe, and a decrease over lower latitudes and the Mediterranean, with responses tending to be larger for the more extreme climate change scenario. These changes are associated with the changes in the extreme winds over land.

By considering the parameters of population density and wind intensity threshold we could explore the relevance of future socio-economic and adaptive changes on the windstorm impacts. For the population-weighted SSI, smaller increases are found in the future cases where population densities do not change and/or adaptation to increases in extreme wind speed climatologies occur.